

suggesting gelation may have occurred in the column. The small flow tank result showed the lateral dispersion and MnO₄⁻ release duration up to 15 days after injection of 40 g/L SRP-G solution mixed with 100 mL and 50 mL each of 40 wt% and 50 wt% colloidal silica, respectively. The large flow tank results showed that 40 g/L KMnO₄ solution with 200 mL and 100 mL each of 40 wt% and 50 wt% colloidal silica, respectively, injected into saturated sandy media laterally spread through the sandy media. The extent of spreading varied in three layers with a MnO₄⁻ release duration up to 30 days in the top, middle and bottom layers. Permanganate release duration results suggested the formation of gels from which MnO₄⁻ is slowly released and dispersed migrate to treat dissolved TCE plumes. https://etd.ohiolink.edu/apexprod/rws_etd/send_file/send?accession=ohio161797021188483&disposition=inline

BENCH-SCALE ELECTROCHEMICAL TREATMENT OF CO-CONTAMINATED CLAYEY SOIL

Pelletier, A., A. Hohner, I.D. Akin, I. Chowdhury, R. Watts, X. Shi, B. Dutmer, and J. Mueller. Illinois Center for Transportation Project R27-183-HS, 119 pp, 2021

An accelerated in situ electrochemical treatment that augments electrokinetics with H₂O₂ and is adaptable to use at construction sites was developed to remove high molecular weight (HMW) PAHs and metals from clayey soil cost-effectively. Bench-scale reactors resembling field-scale in situ electrokinetic systems were designed and fabricated to assess treatment. Model contaminants pyrene, chromium, and manganese were spiked into the model clay, kaolinite. Electrokinetics were imposed using a low-intensity electrical field distributed by graphite rods. Electrolytic H₂O₂ systems distributed electrical current and facilitated contaminant removal. Average contaminant removals of 100%, 42.3%, and 4.5% were achieved for pyrene, manganese, and chromium, respectively. The bench-scale treatment approach can guide future field-scale implementation. Results signify that electrochemical systems that leverage eco-friendly oxidant addition may replace excavation and disposal to address clayey soils co-contaminated with HMW-PAHs and metals. <https://apps.ict.illinois.edu/projects/getfile.asp?id=3698>

SURFACE-ACTIVE BEHAVIOR OF SELECT PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) AND THEIR MIXTURES

Chen, J., A. Adegbulu, J. Huang, and M. Brooks. ORISE Meets the World Monthly webinar, 2 December, 15 slides, 2021

Surface tension of seven PFAS compounds with different carbon chain lengths (n = 4, 6, and 8) and functional groups (COO⁻ and SO₃⁻) was measured as a function of concentration for individual compounds and their mixtures. Six PFAS showed a sharp decline in surface tension with increasing concentration with no evidence of micelle formation. The PFAS compounds showed different surface activities which may relate to carbon chain length and functional groups. All mixtures showed surface tension measurements intermediate to individual compounds. https://cfpub.epa.gov/si/si_public_file_download.cfm?download_id=544340&tab=CFSFR

ENHANCED ELECTROKINETICALLY-DELIVERED PERSULFATE AND ALTERNATING ELECTRIC FIELD INDUCED THERMAL EFFECT ACTIVATED PERSULFATE IN SITU FOR REMEDIATION OF PHENANTHRENE CONTAMINATED CLAY

Wen, D., X. Guo, Q. Li, and R. Fu. J. Journal of Hazardous Materials 423(Part B):127199(2022)

A strategy is proposed to deliver persulfate (PS) into clay electrokinetically. PS was used to flush a cathode to continuously inhibit water electrolysis. A novel approach of heating soil by alternating current (AC) was applied to thermally activate PS in situ. The mass transfer efficiency of PS by electroosmotic flow is about 20 times that by electromigration. When PS was added to the anode chamber, the PS solution continuously flushed the cathode creating relatively balanced influent and effluent flow rates, and significantly improving the mass transfer efficiency of PS. Compared to using NaNO₃ solution flushing, an increase of 51.7% was achieved, reaching an average phenanthrene degradation rate of 78.8% in the soil cell. The highest overall PHE removal rate was 87.8%, using a cycle strategy of enhanced electrokinetically-delivered PS followed by AC heating. Electron paramagnetic resonance spectroscopy analysis showed oxidative radicals (SO₄^{-•}/OH) were the major species responsible for enhanced PHE degradation. Results demonstrate that this cycle strategy is a viable method for remediation of PAHs in clay.

General News

PROPOSED DESIGNATION OF PERFLUOROCTANOIC ACID (PFOA) AND PERFLUOROCTANESULFONIC ACID (PFOS) AS CERCLA HAZARDOUS SUBSTANCES

EPA Website, Updated September 1, 2022

EPA is proposing to designate two per- and polyfluoroalkyl substances (PFAS) -- PFOA and PFOS, including their salts and structural isomers -- as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund. This proposed rulemaking would increase transparency around releases of these harmful chemicals and help to hold polluters accountable for cleaning up their contamination. The rulemaking would require entities to immediately report releases of PFOA and PFOS that meet or exceed the reportable quantity to the National Response Center, state or Tribal emergency response commission, and the local or Tribal emergency planning committee (local emergency responders). <https://www.epa.gov/superfund/proposed-designation-perfluorooctanoic-acid-pfoa-and-perfluorooctanesulfonic-acid-pfos>

USING A FISH-BASED METRIC TO TRACK REMEDIATION AND RESTORATION EFFECTIVENESS IN PICKLE PONDS AND PONDS BEHIND ERIE PIER

Gordon, M., G. Ankle, A. Balz, G. Beaubien, J. Hoffman, D. Krabbenhoft, S. Janssen, Jim Lazorchak, T. Luxton, M. Mills, T. Newcomer-Johnson, M. Pearson, G. Peterson, D. White, and R. Yearley. I St. Louis River Summit, virtual, 7-9 March, poster, 2022

This presentation covers fish-based metrics to assess remedy and restoration effectiveness, study designs implemented, and analytical tools that can be leveraged at contaminated sites. Historical sediment contamination from mercury, dioxins, PCBs, and PAHs has resulted in several beneficial use impairments (BUIs), including increased incidence of fish consumption advisory, fish tumors and other abnormalities (removed in 2019), and loss of fish and wildlife habitat in the St. Louis River estuary. The estuary is currently the second largest area of concern (AOC) in the U.S. Remedy and restoration effectiveness research initiatives are developing useful metrics to measure the progress and success of AOC projects. Examples include the Ponds behind Erie Pier (PBEP) and Pickle Ponds, which are small embayments with historical contamination receiving mostly stormwater through hydrological connections on the Minnesota and Wisconsin sides of the estuary, respectively. PBEP is a priority remediation site due to a wide array of contaminants of concern, including organic and metal contaminants. Pickle Pond is a remediation and restoration site that is both contaminated and ecologically degraded. Measuring remedy and restoration effectiveness requires documenting baseline and reference conditions before the start of a project, including contaminant bioaccumulation, industrial mercury contribution indices of biotic integrity based on fish, and other indicators. Once PBEP and Pickle Pond undergo cleanup and environmental monitoring indicates environmental status improvements, BUIs can be removed, and delisting of the St. Louis River estuary as an AOC can begin. https://cfpub.epa.gov/si/si_public_file_download.cfm?download_id=544423&tab=CFSFR

UNDERSTANDING PAHS—TABULATION ISN'T INTERPRETATION. A PUBLICLY AVAILABLE TOOL TO DETERMINE THE SOURCE OF PAHS AT YOUR SITE

Fuelbrandt, P. and C.D. Sandau. I REMTECH 2021: The Remediation Technologies Symposium, Banff, AB, Canada, 13-15 October, 13 slides, 2021

A method to determine whether PAHs measured in environmental samples are petrogenic (e.g., the release of a hydrocarbon product) or pyrogenic (e.g., wind-blown ash, burned organic material, creosote) based on widely accepted forensic practices is demonstrated in this presentation. The process of selecting lab analysis, preparing data for interpretation, visualizing data, and determining PAH sources is also discussed.

Slides: <https://www.nrc.gov/condemned/unlabeled/2021/11/18/21-Sandau.pdf>

Longer abstract: <https://www.nrc.gov/condemned/unlabeled/2021/11/18/21-Program-Abstracts-75.pdf>

THE ACCELERATING IMPORTANCE OF DATA SCIENCE IN REMEDIATION

Horst, J., S. Burnell, R.J. Stuetzle, L.M. Austrins, and D. Schanze.

Groundwater Monitoring & Remediation 42(3):23-29(2022)

The focus of this article is on how data science can continuously improve remediation portfolio management. One example examines optimizing sampling programs by evaluating regional variability of analytical requirements, the number of duplicates/trip blanks, productivity, scoping standards, and variability. Another example evaluates the effectiveness of various remedy types across large portfolios. See a *snippet of the article at* <https://ngwa.onlinelibrary.wiley.com/doi/10.1111/gwmr.12535>

THE CALIFORNIA GEOTRACKER DATABASE: A UNIQUE PUBLIC RESOURCE FOR UNDERSTANDING CONTAMINATED SITES

Beckley, L., S. McMasters, M. Cohen, D. Cordano, S. Rauch, and T. McHugh.

Groundwater Monitoring & Remediation 42(3):105-115(2022)

The California GeoTracker website and database serve as a public repository for a wide variety of information related to the investigation and remediation of cleanup sites in California. Responsible parties must electronically submit lab analytical results for environmental samples along with reports and other information required under California regulations. The GeoTracker website also supports public access to the entire database of lab analytical results, dating back to 2001, and includes ~285,000,000 analytical records for >50,000 contaminated and formerly contaminated sites. Because of the large volume of publicly-available data, GeoTracker has been used as the primary data source for several data mining studies in the last 10 years. This article describes how GeoTracker has evolved to account for changes in regulatory priorities, such as understanding vapor intrusion mechanisms and distribution of PFAS in the environment while maintaining database continuity.

The Technology Innovation News Survey welcomes your comments and suggestions, as well as information about errors for correction. Please contact Michael Adam of the U.S. EPA Office of Superfund Remediation and Technology Innovation at adam.michael@epa.gov or (703) 603-9915 with any comments, suggestions, or corrections.

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